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ABSTRACT

This report discusses how three major strains of educational research are converging on a compelling new concept: critical thinking is not a set of skills to be taught, but a natural capacity, involving creating and revising patterns of information to be exercised and strengthened. Thus, according to the report, the appropriate classroom practice is not a set of lesson plans, but an orchestrated experience of challenging, engaging learning experiences. The report characterizes reading as one of the most powerfully thought-provoking experiences available to us, as readers exercise critical thinking in order to construct meaning from text. With the addition of the new technology of learning information systems such as Accelerated Reader, teachers can guide and motivate students to read text that is both interesting and appropriately challenging. In nine sections, the report discusses evidence of the reading-thinking link; what critical thinking is; recent approaches in educational theory; a new consensus on critical thinking; literature-based reading and critical thinking; what kind of reading best develops critical thinking; Accelerated Reader and the zone of proximal development; reading and other thinking activities; and offers a conclusion. Fourteen references are attached. (SR)

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REPORT from the Institute for Academic Excellence

November 1997

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Critical Thinking and Literature-Based Reading

Introduction

As researchers discover more about how we think and learn, the long-standing idea of critical thinking as a series of discrete skills is being replaced. Current research suggests that critical thinking is a process of creating patterns, or "conceptual maps," that help us make sense of the world. The best way to develop the brain's capacity for critical thought is to stimulate it with appropriately challenging problems and experiences.

Literature-based reading has an important effect on the development of critical thinking. A reader must recognize patterns within text, fit details into these patterns, then relate them to other texts and remembered experiences. Readers engage in critical thought to get at the meaning of what they read. By guiding students to appropriately challenging reading experiences within their zone of proximal development, teachers play an important role in helping students exercise and enhance their ability to think critically and creatively.

Evidence of the Reading-Thinking Link

A growing body of evidence illustrates the vital link between literature-based reading and critical thinking. For example, the Institute for Academic Excellence study, *Impact of the Accelerated Reader on Overall Academic Achievement and School Attendance* (Paul, 1996), which examined reading data from more than 6,000 schools, showed that students in schools that owned AR did significantly better on both standardized and performance-based assessments designed to measure critical thinking. These students showed improvements in reading, writing, math, and social studies, suggesting that the thinking skills developed by literature-based reading are readily transferable to other academic tasks. These findings have been confirmed by a second Institute study, *Learning Information System Effects on Reading, Language Arts, Math, Science, and Social Studies* (1997), which demonstrated the same relationship between use of the reading program and enhanced measurements of critical thinking.

What is the relationship between reading and the development of critical thinking ability in students? The answer lies in a new understanding of what it means to think critically, and how the process of creating meaning from text exercises and develops the individual's capacity for critical thought.

What is Critical Thinking?

Despite the widespread use of the term in education today, it is difficult to arrive at a definition of "critical thinking." The phrase itself is often used interchangeably with "higher-order," "creative," "divergent," "evaluative" or "analytical" thinking, "reasoning," and "problem-solving." As we shall see, this profusion of terms arises from a variety of notions of what critical thought is like and how it works. However, there is general agreement about the kind of abilities associated with critical thought: recognizing patterns and relationships; applying general principles to solve

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specific problems; judging the accuracy of a statement or the strength of an argument; synthesizing unique and creative insights and ideas.

The influential work of Jean Piaget, first published in the 1920s and 30s, has been a major influence on the way educators think about the development of critical thinking. Piaget's experiments demonstrated that, as children grow, they gradually develop the ability to perform various mental tasks. Piaget (1928) referred to these mental tasks as "operations" that children acquire, one after the other, increasing in complexity with the child's maturity. These observations became the foundation of developmental psychology, and led to a widespread assumption that thinking consists of a hierarchy of cognitive "skills."

This concept was further developed and popularized by Benjamin Bloom and his colleagues through their introduction of the *Taxonomy of Educational Objectives* in 1956. The familiar pyramid of Bloom's Taxonomy pictured thinking skills as a series of six discrete layers with "Knowledge" at the bottom and such skills as synthesis and evaluation at the top (Figure 1). The phrase "higher-order thinking" began to enter our vocabulary.

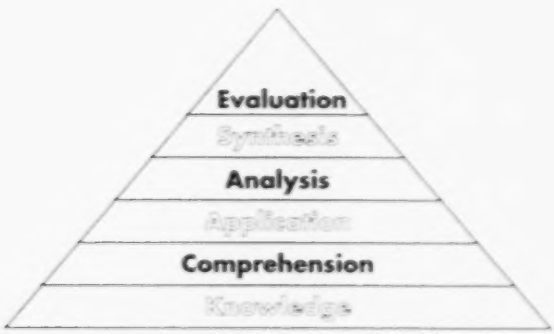

Figure 1

Today, a growing number of psychologists and educators are questioning the hierarchical development concept of "thinking skills."

- Even though Piaget clearly showed that children can perform certain kinds of operations only when they have reached a certain level of maturity, it doesn't necessarily follow that the thinking involved in different operations is really a different kind of thought. Is there such a thing as "critical thought," or do we simply "think critically?"

- Because every kind of thought is about something, it is inseparable from the knowledge that makes up its "raw material." Can there really be an abstract, general "thinking skill" that we can teach or learn, or does critical thought occur naturally when we understand things well enough to think about them?

- While we can come up with general definitions of thought processes, it's difficult to imagine thinking that doesn't involve many such processes simultaneously. To use Bloom's categories, Synthesis can't take place without Evaluation, and neither can happen without involving Knowledge and Comprehension. Can discrete categories of skills really be useful in understanding how someone actually thinks?

- The hierarchy implied by these developmental schemes can easily turn into a value judgment. Certain kinds of thinking are more mature and advanced than other kinds, and are presumably "better." The skills at the top of the pyramid are also presumed to be harder: Not everyone can think this way, and instruction in these skills is necessary and important. Are certain kinds of thinking really more important or difficult than others?

As the psycholinguist and educator Frank Smith (1990) has written: "All the supposed elements of higher-order thinking are in fact commonplace. They are not separate activities at all, but a continuous and intrinsic part of everyday thought" (24).

These concerns, along with the findings of recent research, have led psychologists and educators to look for a more integrated and holistic way to understand what critical or creative thinking is and how it occurs.

Recent Approaches

In the past 30 years, three major strains of educational theory have been converging on a compelling new concept: Critical thinking is the way a learner creates a model, map, or story about the world. By recognizing patterns and fitting details into them, we construct a kind of conceptual map that helps us recall information in creative ways, gives us the direction to learn new things, and motivates us to explore and imagine. Cognitive psychologists, social constructivists, and brain-based learning theorists largely agree that the best way to foster critical thinking is to create learning

environments in which students are stimulated to exercise this conceptual mapping skill.

Cognitive Psychology. Cognitive psychologists are concerned with understanding the processes that occur within the mind. In the 1970s, the cognitive approach to learning began to center on *schema theory*. According to this theory, learning consists of creating and developing a model, or schema, in which every piece of information we know is related to other information in a way that helps us experience the world as coherent and predictable (Rumelhart, 1980). With every new experience, the mind plays a game of Twenty Questions, fitting this experience into the myriad interrelationships of our cognitive model. If we encounter information that we cannot fit into our schema, we must either change our model to accommodate it or ignore it. The associative nature of our schema helps us quickly recall information and apply abstract concepts to create new insights and solutions. This theory also explains why our prejudices and preconceptions can keep us from perceiving things that may be obvious to others.

Social Constructivism. In the 1980s, the work of Russian psychologist Lev Vygotsky began to have a major impact on education theory in the West. Vygotsky stressed the importance of thinking and learning as a social process. As children, we learn to think by internalizing narratives about the world that we hear from others. These narratives provide the language in which we think. Indeed, Vygotsky said, thought is essentially "inner speech," the internal functioning of the stories we learn and construct about the world.

Brain-Based Learning. Most recently, new research into the biochemical functioning of the brain is having an impact on our concept of thinking and learning. Brain researchers have learned that the brain builds neural networks to process information; learning, relearning, and forgetting are associated with the building and rebuilding of these neural pathways in the brain (Sylwester, 1995).

Brain researchers distinguish between two kinds of memory: taxon memory, which involves the storage of fixed, context-free information; and locale memory, which involves the development of "conceptual maps." Taxon memory is associated with "rote" learning and memorization, and is very rigid and untransferable. We have to work to memorize the information, and it can only be recalled in the special way we memorized it. For instance, if you were asked, "What is the 14th letter of the alphabet," the only way to recall "N" would be to recite the alphabet to yourself starting from "A" and counting to 14.

Locale memory, on the other hand, involves creating patterns of information, of "finding your way around" a subject and making connections between facts. It requires less mental effort to retain information this way, and in fact this is how we "learn" most of what we know. For instance, you could probably locate any point on your route from home to school, without ever having had to work at "learning" the route. Because the mapping process involves the same brain centers involved with emotion, this kind of learning is associated with intrinsic motivation and the desire for discovery. Finally, because it is essentially a function that involves evaluation, analysis, and the synthesis of new connections, the development of locale memory is a process of critical thinking (Caine and Caine, 1991).

A New Consensus on Critical Thinking

Whether they use the terms "schema," "internalized narrative," or "conceptual map," cognitive psychologists and brain researchers agree on a central idea: Critical thinking involves creating and revising patterns of information. Rather than being a set of discrete skills that must be learned and applied with effort, this kind of thinking goes on naturally and continually in each of us from the time we're born. As we encounter new and unfamiliar experiences, we strive to fit them into our wonderfully large and complex map of the world. In the process, we increase our capacity to analyze information, apply abstract concepts from one set of information to others, and create new ideas and creative solutions to problems.

The implications of this consensus for education are clear. Rather than attempting to teach generalized, abstract thinking skills, the most effective way to develop critical thinking in students is to provide them with challenging, engaging learning experiences that stimulate them to expand and revise their mental models of the world. As brain-based learning advocates Renate and Geoffrey Caine (1991) have written,

> "Learners are patterning, or perceiving and creating meanings, all the time in one way or another. Daydreaming is a way of patterning, as are problem-solving and critical thinking. Although we choose much of what students are to learn, the ideal process is to present the information in a way that allows

brains to extract patterns, rather than attempt to impose them" (82).

There is one such experience that is readily available, time-tested, and increasingly easy for teachers to manage in the classroom: self-selected, literature-based reading. As we will discuss, readers must exercise critical thinking in order to construct meaning from text. By guiding and motivating students to read text that is both interesting and appropriately challenging, teachers play a crucial role in helping students develop their capacity for critical thought in a way that taps the natural activity of their minds.

Literature-Based Reading and Critical Thinking

When we read a book, we don't just go wading into a sea of words and details. We look for patterns, and we try to place the details of the book into these patterns. We draw these patterns from the book itself, from other books we've read, and from other experiences in our lives. In essence, we create the story and its characters in our minds as we build these patterns from the details of the text. According to reading researcher Rand Spiro (1980),

> "Meaning does not reside in words, sentences, paragraphs, or even entire passages considered in isolation . . . What language provides is a skeleton, a blueprint for the creation of meaning" (245).

Reading comprehension is not a passive consumption of meaning, but requires the active, thoughtful participation of the reader to create patterns of meaning.

Students of literature refer to these patterns with such terms as plot, argument, character, and theme; students of schema theory use the term *story grammar* to refer to the structure of patterns a reader must comprehend to construct meaning from a book. Advocates of brain-based learning recognize this as an example of the "conceptual mapping" process that involves the entire brain in critical thinking.

When we read a work of fiction, we are making a conceptual map that includes narrative sequence, plot, and character development. We learn our way around the book, rather than "memorizing" it. Not only does our map associate the details of the story; it also puts the story in the larger context of other books we've read and our own life experiences. When our conceptual map is complete, we can answer many detailed questions about important elements of the story, and perhaps be able to recall scenes or dialog with a great deal of precision. In this process we can recognize many of the elements of Bloom's Taxonomy: To construct patterns of meaning from the book, we must analyze and evaluate the significance of each bit of information, apply patterns from one element of the test to another, and synthesize plot and theme from thousands of individual details.

From their earliest encounters with literature, and increasingly as the texts become more complex, readers must engage in constructive, analytic thought to get at the meaning of literature. Literature-based reading practice, then, inevitably involves practicing critical-thinking skills, and this practice develops the brain's capacity for thought. As Michael Strong, author of *The Habit of Thought* (1996), has observed, practice at making meaning from challenging text "is a microcosm of the problem of learning how to learn."

What Kind of Reading Best Develops Critical Thinking?

As we have discussed, the patterning process of critical thinking is a response to stimulus from our environment. Brain researchers distinguish between two kinds of stimulus: distress, experiences that cause fear and set off our "fight or flight" responses; and eustress, experiences that generate curiosity and stimulate our engagement with our surroundings. Distress and eustress are associated with chemical changes in the brain centers that control both our emotional responses and our integrative, conceptual thinking. Eustress stimulates critical thinking; distress interferes with thought, even to the point of shutting it down (Caine and Caine, 1991).

Psychologist Mihaly Csikszentmihalyi (1991) creates a strikingly similar model with his concept of optimal experience, or the "flow" state. Csikszentmihalyi defines flow as

> "a sense that one's skills are adequate to cope with the challenges at hand, in a goal-directed, rule-bound action system that provides clear clues as to how well one is performing" (71).

This optimal flow state results from an ordering of consciousness that makes one's mind more complex—precisely the process of critical thought. It is no coincidence, then, that Csikszentmihalyi reports

intensive, challenging reading as one of the most common flow-evoking experiences.

Csikszentmihalyi illustrates the impact of challenge on the flow state with a graph that compares the individual's perceived skill level with her perception of the challenge of an activity (Figure 2). If an individual is challenged above her ability to respond, the result is anxiety; lack of challenge results in boredom. With the proper balance of challenge and skill, however, the individual has a sense of mastery at the peak of her ability—the flow state, which results in both cognitive development as well as the intense enjoyment of intrinsic motivation. Achieving the flow state, then, requires either that the challenge of the task be appropriately matched to the individual's present skill level, a level which increases the more the individual experiences the optimal flow experience.

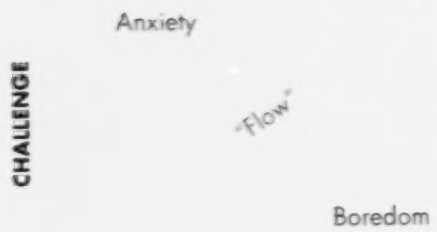

Figure 2

Csikszentmihalyi's analysis underlines the importance of feedback to the optimal experience. What is crucial is not simply the student's skill level, but rather the student's accurate perception of his own competence. Performance feedback permits the student to recognize when his skills are adequately matched to the challenge at hand, and to adjust his behavior when they are not. At the same time, the sense of competence and mastery this feedback promotes motivates the student to stay fully engaged in the task.

The concept of metacognition helps us apply this insight to the realm of critical thinking. Metacognition refers to the student's awareness and control of her own thought processes. Timely and detailed feedback permits the student to learn which thinking strategies are effective in a given situation; if a student is not aware that he believes something which is factually incorrect, the incorporation of this error into existing schemas is likely to cause substantial confusion (Powell, 1987). Brown (1980) identified the metacognitive elements of reading comprehension: clarifying one's purpose for reading, identifying important elements of the text and ignoring irrelevant ones, checking to ensure understanding through self-questioning, and taking corrective action (such as reading ahead, re-reading, and so on) if comprehension failures are detected. Performance feedback mechanisms increase the student's ability to recognize successful thinking strategies and develop the ability to construct meaning from text.

The implication for reading practice is that an appropriate level of challenge and feedback will stimulate the student's metacognitive awareness, motivation, and critical-thinking ability. Not enough challenge, and the student will not be stimulated to think critically; too much challenge, and curiosity will be replaced by frustration and hopelessness. And without adequate feedback, students (and teachers) will be unable to judge whether the challenge is appropriate. The key to using literature-based reading practice to foster critical thinking in the classroom is to use feedback and teacher intervention to guide each student to reading material at the appropriate level of challenge and interest to meet his or her developmental needs.

Vygotsky (1962) has given us a useful way of thinking about leveled challenge with his concept of the "zone of proximal development." In this developmental zone, the learner performs successfully most of the time, but is regularly presented with more difficult tasks that require instruction to complete. Vygotsky theorized that this kind of learning activity, aimed right below the learner's developmental "cap," would result in the most effective learning.

The Institute's Reading Renaissance® program has successfully applied this concept to the readability levels of text, in which familiar words provide contextual clues to the meaning of more difficult words. If a child having a sixth-grade reading ability reads a first-, second-, or third-grade level book, very little, if any, growth in reading ability is likely to occur. But as the material approaches the child's current reading ability, growth in reading occurs at an increasingly rapid rate because the child is exposed to vocabulary and more difficult sentence construction which begin to stretch his ability. At some point, however, the vocabulary becomes too difficult, the sentence structure too complicated, and so it becomes increasingly harder for

the child to create meaning. Eventually, the student will reach what is commonly called the frustration level where reading comprehension drops very rapidly to zero.

The point between unchallenging and frustratingly difficult text, the point at which maximum growth occurs, is the zone of proximal development or ZPD. It is the zone in which the child is both challenged and presented new vocabulary, but also in which there are enough context clues that the child can construct meaning without being frustrated. In a sense, even though the child reads a book independently, this can be considered assisted reading. The assistance to discover the meaning of new words and concepts is provided by the known portion of text. Therefore, for given students, there will be a range of reading difficulty in which the text itself provides "instruction" that most effectively promotes both comprehension development and the exercise of critical thinking. We use the term ZPD reading level to refer to this range.

Accelerated Reader® and the ZPD

Applying the ZPD concept presents obvious difficulties to the teacher standing before a class of 20 or 30 students. How is one to know what kind of reading practice will be optimally beneficial to each of the very different individuals in the classroom? Establishing a reading ZPD for every student would be a challenging enough accomplishment for a given day—but a student's actual ZPD will change constantly, requiring an equally dynamic variability of reading practice in response. With traditional methods of observation and guesswork, the ZPD would be a murky zone indeed for the classroom teacher.

The Accelerated Reader (AR) provides the key to measuring individual ZPDs and helping students use them to foster their own reading development. AR is a computerized learning information system (LIS) that assesses reading comprehension, tracks performance, and provides reports for teachers and students. By providing timely, accurate information, this task-level LIS system allows teachers to adjust instruction and address the individual needs of each student. At the same time, LIS feedback fosters metacognitive development on the part of the student, and thereby enhances student motivation by increasing self-control and mastery.

Two essential kinds of feedback information provided by AR help teachers guide students to effective reading practice:

- The reading level assigned to each book on the AR list provides an approximation of the challenge presented by any given text.

- The percent correct that a student achieves on an AR book test is a measure of how well the student comprehended the book.

Therefore, if a student consistently achieves a high percentage correct at a given reading level, we know that the student can comprehend reading material at that level. To apply the ZPD concept, then, we want to establish an AR reading level at which the student scores well enough to prove comprehension, but not so well as to demonstrate a lack of challenge.

In practice, this works out to be an average score of between 85 to 92 percent correct on Accelerated Reader tests at a given AR reading level. If, at a given level, the student is scoring consistently below 85 percent, it is an indication that the reading at that level is too difficult for him to construct enough meaning to provide context clues to more challenging words and passages. Conversely, a student with consistently perfect scores is unlikely to be receiving the level of challenge that promotes critical thinking. Within the 85 to 92 percent range, the student is likely to be concentrating her reading practice at an adequately challenging level. This is an important window of opportunity for the teacher, who should encourage the student to stay in this range by gradually but persistently increasing the level of reading challenge he undertakes.

By finding the range of AR reading levels at which the student scores between 85 and 92 percent correct on Accelerated Reader tests, and encouraging the student to concentrate her reading practice within those levels, we are effectively measuring the student's ZPD and exploiting it to create the conditions for optimal growth in reading comprehension and critical thinking. The ability of the Accelerated Reader to generate this kind of performance data on each child makes it a tremendously powerful tool to help students create the learning experience that best meets their own individual needs.

This score range is only a rule of thumb for estimating purposes. We cannot over emphasize the role of the teacher in using an LIS system like Accelerated Reader to guide student reading effectively. The purpose of the information AR provides is to assist teachers to develop a deeper and more dynamic understanding of each student. It is a valuable source of information, but

equally important are the teacher's personal knowledge of the student: her interests, worries, goals, and self-image. All of these must come into play in guiding a student to reading practice that will be stimulating, challenging, and thought-provoking. It is also beneficial to remember that readability is only one element of challenge in a text; topic, genre, and book length are also important challenge factors. Teachers must rely on their professional judgment to determine the appropriate level of reading challenge for each student, and the most effective ways to motivate that student to read at that level.

Reading and Other Thinking Activities

In addition to serving as a stimulus to critical thinking in itself, reading also provides a wonderful groundwork for other kinds of classroom activities that can stimulate thinking. Response journals and other literature-related writing assignments offer an opportunity to extend the construction of meaning from the text to self-expression. Book discussions of all kinds also help students engage with the challenges of the text, and reinforce the social nature of critical thinking.

A fascinating approach to literature discussion is Socratic Practice, in which a teacher and a group of students work together to get at the meaning of a passage of difficult, provocative text (Strong, 1996). As students confront the ambiguities of the text and attempt to clarify its meaning, they join together in questioning meaning, comparing interpretations, and building intellectual consensus. The teacher serves as a coach and co-learner, helping guide the conversation while making the students responsible for the task of deciding what the best meaning for the passage may be. Besides building thinking skills, Socratic Seminars reinforce the concepts of polite and constructive conversation as well as intellectual integrity. It's an example of what Renate and Geoffrey Caine (1991) refer to as "orchestrated immersion," in which the teacher designs an experience that provokes the student's natural processes of thinking and learning.

Conclusion

As educators grapple with the question of how best to promote critical thinking in students, a new consensus is forming. According to this new view, critical thinking is not a set of skills to be taught, but a natural capacity to be exercised and strengthened. The appropriate classroom practice, then, is not a set of lesson plans, but an orchestrated experience of the kind of engaging challenge that stimulates critical thinking and thereby develops students' ability to think.

For teachers who themselves find substantial challenge in presenting good lessons, the concept of orchestrating thought-provoking experience may appear daunting. It should be comforting to know then, that good, old-fashioned book reading is one of the most powerfully thought-provoking experiences available to us, especially under the thoughtful guidance of a teacher. As we construct meaning from challenging text, we create a richer and more complex conceptual map of both the text and the world—the very essence of critical thinking. With the addition of the new technology of learning information systems, guiding students to the kind of reading experience that fosters critical thinking can be accomplished by every teacher.

For more information, or for additional copies of this report, write or call:

The Institute for Academic Excellence
455 Science Drive, Suite 200
University Research Park
Madison, WI 53711
(800) 200-4848

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